

PARADOX VALLEY, WORLD SOURCE OF RADIUM

From a 'Worthless' Stretch of Colorado-Utah Desert Comes the Basis of America's Gift to Mme. Curie, Carnotite Ore. Germany, Before the War, Nearly Owned It

By ARTHUR CHAPMAN

WHEN Mme. Marie Curie visits the United States in May and is presented with radium valued at \$100,000 from the women of this country it will be truly an all-American gift which she will receive.

Out in the grim, broken, sage-covered desert where southern Colorado and Utah meet, there is produced the carnotite ore from which most of the world's supply of radium is recovered. Valuable mines have been located in arid gulches that were worthless even for cattle grazing. Concentrating mills have been erected and little mining settlements have grown up where not even the courageous "dry farmer" planted his homestead a few years ago. Burros loaded with sacks of rich radium-bearing concentrates pick their way along rough trails to the dusty highways that reach out into the not less dusty desert. Their burdens are shifted to ore wagons—one wagon and a trailer to a six-horse team usually—and there is much rattling of tires and cracking of whips and flinging of oaths as the teamsters jolt their way to the nearest railway station, perhaps fifty or seventy-five miles distant.

Sacks of Ore Yield Pin-Point of Radium

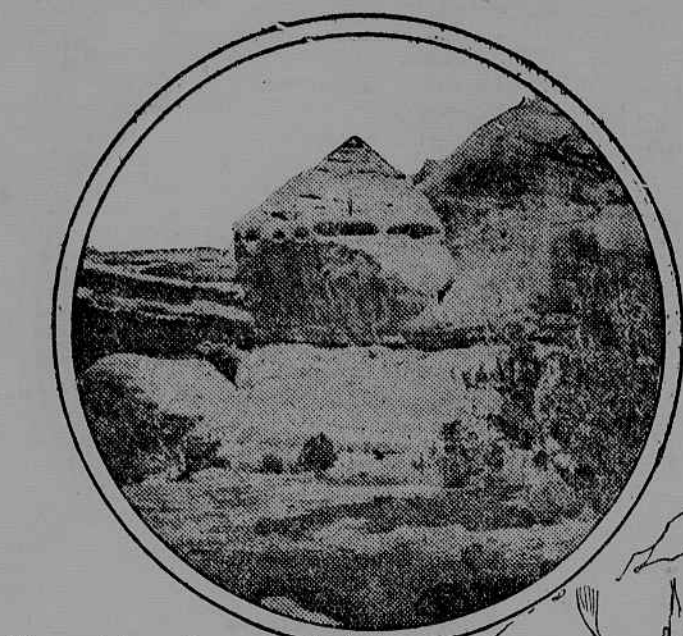
At the railroad the sacks of canary-colored ore, which have been sorted from countless tons of worthless or low grade surrounding rock, are shipped to a reduction plant in the East—Mme. Curie is to visit one at Pittsburgh, according to dispatches—and, through a long and expensive process, involving much settling in tanks, the precious element is secured, pin-point by pin-point.

Mme. Curie has expressed a desire to visit the radium fields, if the trip is possible, and also to see the best of American scenery. Her route will be through a land of grandeur if she visits the carnotite fields of Colorado. There is only one route to the radium country—the Denver & Rio Grande Railroad out of Denver. Crossing the Continental Divide at one of its sublimest points, after having transferred to the narrow gauge line, Mme. Curie will find herself in the Uncompahgre Valley. Here the government has brought water from the Gunnison River through an amazingly long and costly tunnel, and irrigated fruit farms have sprung up where there was only sagebrush a matter of fifteen years ago. As the lower end of the valley approaches the Utah line the desert effect gets more pronounced. The country is more broken and the sagebrush is in the ascendancy. The railroad swings off in another direction, Placerville being the final station. Beyond Placerville the country has scant visitation of water. As it drops away toward the Utah line it becomes dryer and more desert-like in its character. There are few trees on the hills, and occasional erosions of sandstone rear their heads—strange formations which increase in number and size as one journeys further out on the great plateau that stretches toward the Colorado River.

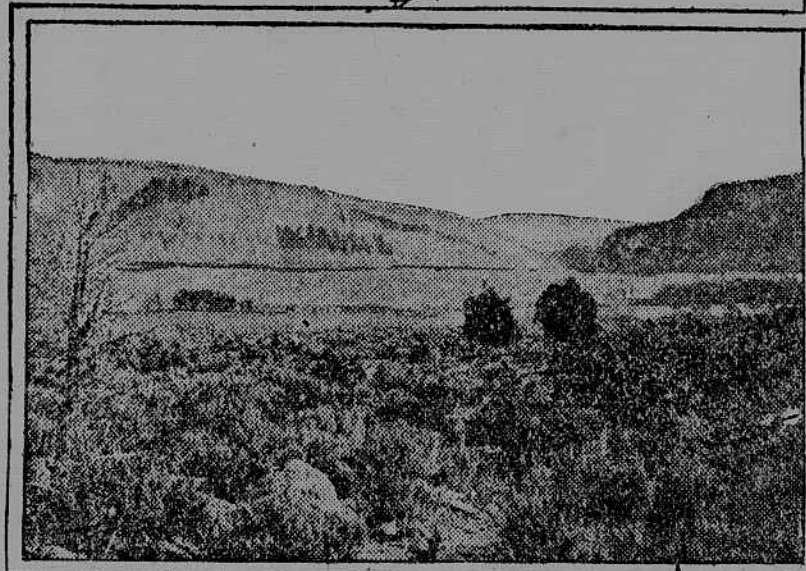
River Fixed Fate Of Paradox Valley

The valleys here would be just as rich as the Uncompahgre if they could be watered, but there is not a Gunnison to be harnessed by government engineers at every turn in the hills, and water is such a scarce article in general that it has to be "packed"—Westerners never tote or carry—for drinking purposes. The Paradox valley, for instance, would have been filled with fruit raisers today, instead of carnotite miners, if the river had only run the other way. But the only stream in the valley ran the short way across, instead of the long way, which gave the place its paradoxical name and which limited the irrigation to no small degree.

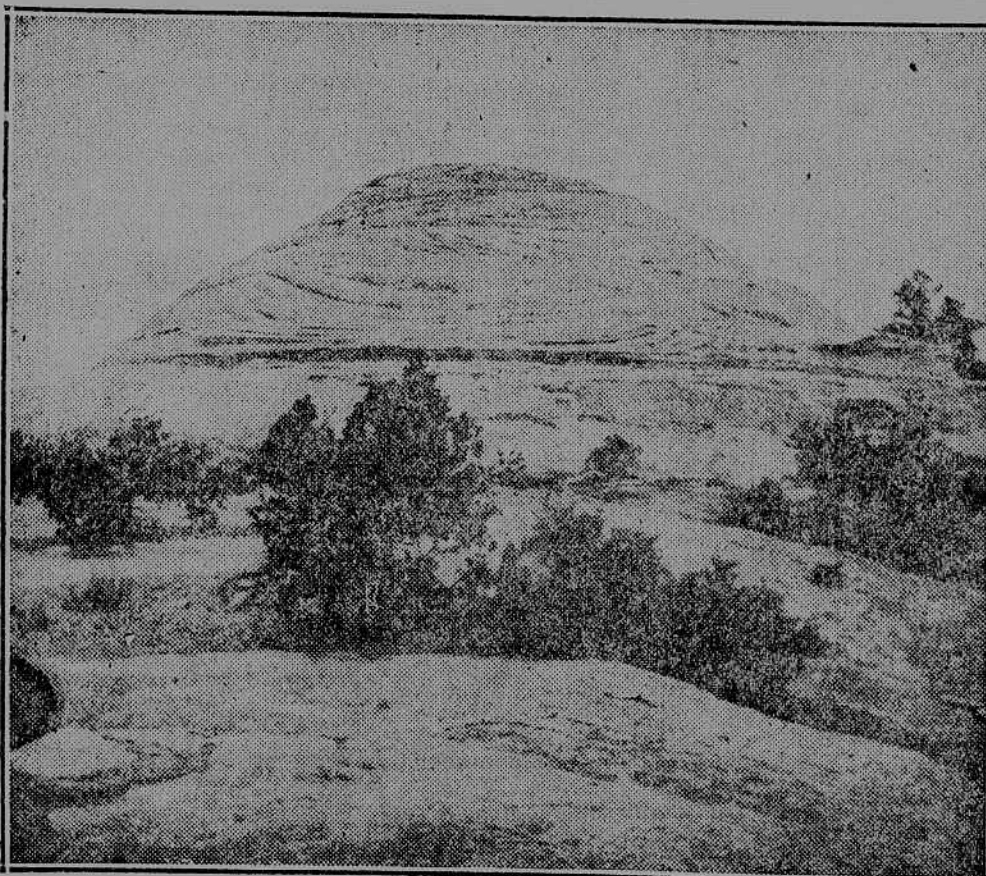
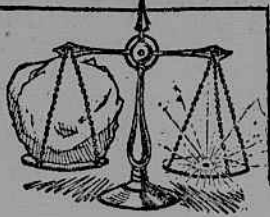
It is in the Paradox valley that the



The gulches of the radium country are prospected for carnotite outcroppings



Paradox Valley in southwestern Colorado, where are found the richest deposits of radium-bearing carnotite in the entire world



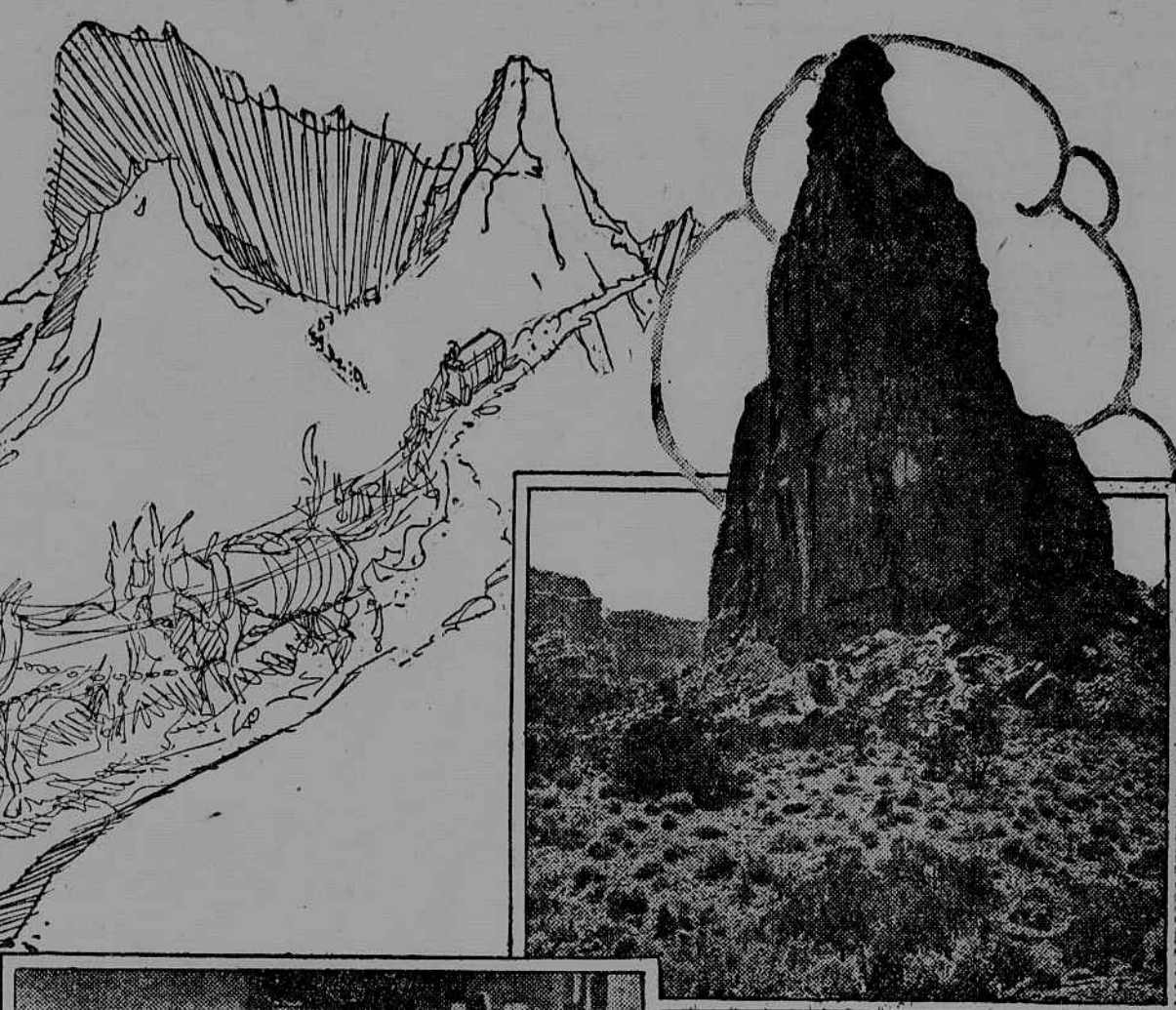
The rugged outcroppings of the carnotite country are peculiar to the entire Colorado River plateau

richest discoveries of carnotite have been made. Some visiting French scientists investigated the strange yellow ore which had been found in the valley and discovered that it was radium bearing, and named it for the man who was then President of France—Carnot. It was not long after the discovery of the carnotite fields of Colorado, and after their extent had been determined by American government scientists, that they were overrun with German agents, buying up every claim that promised to be of value. Germany was out to dominate the world's radium market. Ores were sacked and shipped from Colorado directly to the German market. Only the outbreak of the war prevented the control of the radium situation by the German influences that were at work in the Colorado carnotite fields.

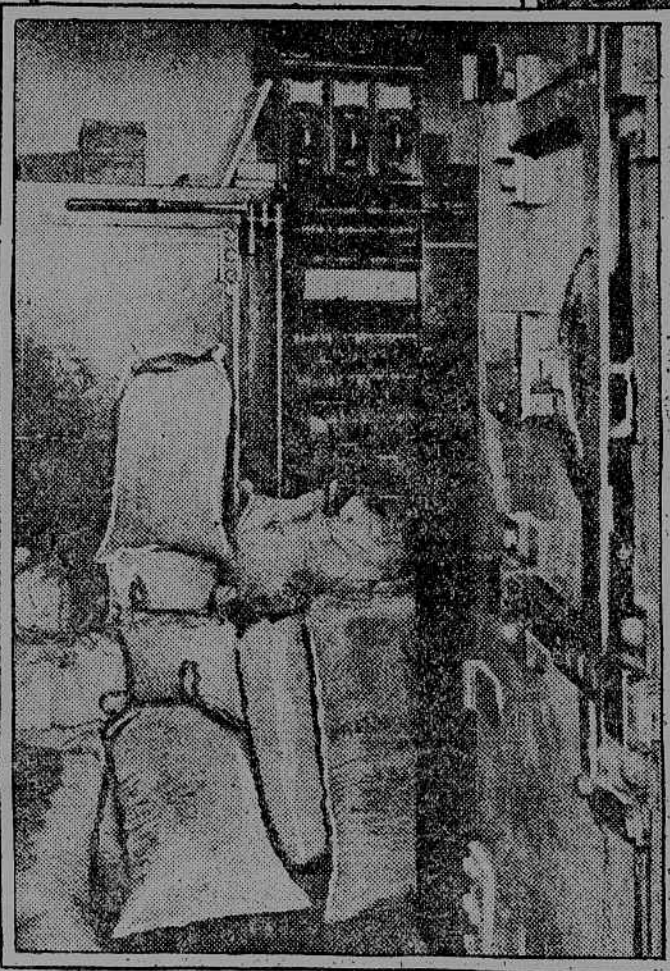
Carnotite mining was quiescent during the war. Claims lost all their value.

Prospectors who had acquired holdings that seemed certain to bring them riches were reduced to penury. Some could not even afford to keep up the necessary assessment work and lost valuable claims. Others sold out for what little they could get. Fortunately, the Bureau of Mines was not asleep. Also there were scientists, outside the government group that has done such notable work in advancing the production of radium, who were alive to the opportunities that were being presented to this country by Germany's elimination from the field.

The Bureau of Mines called attention to the need of some better and more economical process for securing the radium content from the carnotite ores of southwestern Colorado and southeastern Utah. In the feverish hunt for high grade ore much low grade of considerable value was being wasted.



A lonely rock sentinel in western Colorado, showing the rough nature of the carnotite fields



Carnotite concentrates in a safe in Colorado, sacked for shipment to Germany, which country sought to control the radium supply before the war

There was much waste at the mines—something which seemed doubly deplorable in view of the apparent limitation of the production. Those fears have been proved groundless by recent discoveries of huge bodies of carnotite ore by means of diamond drills, enabling prospectors to make discoveries which were hitherto undreamed of. At first it was prophesied that the carnotite fields would not yield more than a thousand tons of carnotite which would assay 2 per cent uranium oxide and 4 per cent vanadium oxide. As a matter of fact, since 1913 there has been mined more than 40,000 tons from the Paradox field of carnotite ore assaying even higher than the figures mentioned. Yet it is said on the authority of one of the companies now operating in the southwestern Colorado field that not over 1 per cent of the carnotite ore of that region has been exhausted. More than forty freighting outfits are now hauling carnotite ore from the Paradox field to the railroad. One company has spent \$4,000,000 in this field, and another company has spent over \$1,000,000 in the last few years. Hundreds of miners and teamsters are employed, and that disappearing type, the prospector, has been revived and new discoveries are constantly being made in the proved area which even now extends well over the state line into Utah.

Freight Rate Highest In United States

In the first years of carnotite mining crude methods were employed, as the business was new and uncertain. Now one finds diamond drills, compressors, rock machines and mechanical hoists. Freighters are paid 50 cents a ton mile for outgoing freight on concentrates shipped to the railroad—which is said to be the highest freight rate paid in the United States. Strictly speaking, carnotite mining is not a "poor man's game." Even after one locates a body of carnotite with a diamond drill it may

be necessary to remove from twenty to thirty tons of rock to get one ton of mill ore. Also it is easy to miss a body of ore in drilling. Consequently much capital is required, and that is the reason why most of the holdings in the district are drifting into the hands of one or two large concerns.

Dust-Proof Machinery To Stop Leakage

In prospecting for carnotite ore, a good idea of the radium content can be obtained by use of photographic plates. By putting the ore in contact with a plate, outside the slide holder, and leaving it there several hours, fog will be discernible on the plate in proportion to the radium content of the ore.

Scientific instruments have been developed for ascertaining the radium content more accurately, but the photographic record proves practical when the other is not available.

Wonders have been accomplished in treating the ore for reduction purposes. It was found that much of the radium content was escaping in dust in the course of reducing the ore. Dust-proof machinery was devised and now such leakage is stopped.

The aim of the prospector, of course, is to find a deposit containing the ultimate of radium content. A claim which yields much high grade ore is equivalent to a fortune. The other day, in Montrose, the county seat of Montrose County, in which the richest carnotite claims are found, a carload of high grade ore brought \$20,000 after spirited bidding by speculators. It was figured that the individual who bought the car of ore would have considerable margin of profit when his purchase was marketed.

Big Industries Profit From Uranium

The uranium content of the carnotite ore is valuable. Uranium is used in the manufacture of high grade dyes and also in steel making. Its possibilities, according to experts, are just being understood. Rich vanadium mines are found in southwestern Colorado, and tungsten has been discovered there in considerable quantities. In fact, the rare metal resources of the state have been only slightly developed. Metals are now being found and mined with profit which meant absolutely nothing to the prospectors and miners of early days, who were attracted to the West by the lure of the gold and silver fields alone. Now one meets prospectors in the field who have made a study of rare metals and who talk in terms that would have been Greek to the old-time gold hunter.

The Paradox valley itself was developed solely as a fruit country. For years it was advertised as one of the best fruit valleys in the Far West. Its sheltered location in the mountains seemed to make it immune to early and late frosts, and apples, in particular, were successfully raised. But the orchardists who came to Paradox valley to specialize in apples were among the first on the ground when the carnotite discoveries were made, and some of them who managed to hold their claims during the war have gained more

In the Person of the Radium Prospector the Old West Comes Some of the Way Back. One Carload of Ore Brought \$20,000. It Is the Sunshine of Paradox Valley

wealth through radium than they ever could have made by their orchards.

The radium prospector finds his profit in locating a carnotite claim and selling out to some one with capital, as it is estimated that one should have a holding of at least twenty-four claims before attempting production. In the early days of the industry prospecting was generally done in the gulches and searching for "bug holes." Carnotite is found in light colored sandstone, and it often crops out in canyons and gulches. Being so brightly colored it is readily distinguishable. The layers are of varying thicknesses. Sometimes a ledge that looks promising will yield little carnotite, and sometimes faint indications will lead to heavy deposits. On one claim mined by government experts for the National Radium Institute several tons of high grade carnotite were found in a soft, claylike mass of black vanadium ore.

Ore Carefully Sorted According to Grades

After the ore has been found and mined there comes the work of sorting. The ore is carefully separated into grades. The high grade is put into sacks for transporting to the railroad. The low grade is sent to the mill for concentrating. One man can sack from 75 to 80 sacks of high grade ore in a day. The sorting must be done by daylight, as it is difficult to distinguish the color of the ore by artificial light. Only the most experienced men are utilized as sorters.

Names of claims in the carnotite mining fields are reminiscent of the names in the oldtime gold mining camps. There is a hint of adventure in such names as the Maggie C., Medea, Dixie, Vanadite, Buckeye, Montana, Urania and Henry Clay.

The "bug holes," of which mention has been made, are carnotite deposits filling holes in the ground several feet deep and from three to five inches in diameter. It has been suggested that these "bug holes," which are filled with carnotite of the highest grade, have been formed by lightning. They are a source of no little profit, and are akin to the pockets of ore found in certain mining districts.

Bureau of Mines Cuts Cost of Production

A cheap and effective reduction process for carnotite ore, as compared with the processes at first in vogue, was worked out by Bureau of Mines experts, with the assistance of Dr. James Douglas, of New York City, and Dr. Howard Kelly, of Baltimore, who wanted to get radium for hospital purposes. The doctors advanced the funds and the government experts devised the process and erected a plant at Denver, where \$100,000 worth of radium was produced by the so-called National Radium Institute. The process then became public property. It is estimated that from June, 1914, when work in the plant began, to January, 1917, when it was stopped, eight and one-half grams of radium had been produced at one-third of the current price. In addition the process had saved the uranium and vanadium content of the ores.

Radium is also found in pitchblende in Gilpin County, Colorado, but it is much more easily extracted from the dry, powdery, yellow carnotite hidden in the rocks and gulches of the southwestern part of the state. No such supply has been found in any other part of the world. One Colorado county, in which the Paradox valley is located, is said to have produced seventy-six grams of radium out of the world supply of one hundred and five grams, or about four ounces. With radium coming into more general use in hospitals all over the world, these strange deposits of living sunshine in Colorado have come into increasing prominence. If radium is to take rank as one of the great curative agencies of the world, it is evident that these American fields from which Mme. Curie's gift comes will hold out the chief hope to distressed humanity.